

## *Abstract*

*Pete Rodriguez*

*Delivering the Power to Explore the Moon, Mars, and  
Beyond*

*Southeastern Conference on Theoretical and Applied  
Mechanics, Mayaguez, Puerto Rico, May 21-23, 2006*

*As part of the United State's vision for space exploration, NASA is preparing the next Space Launch Vehicles. The presentation will address the overall approach to arriving to and establishing a long-term presence on Mars through experience gained by returning to the moon for an extended period of time, developing technologies needed for opening the space frontier, and conducting fundamental science. The design philosophy for the exploration mission success will be discussed and the importance of learning from lessons of the past will be addressed.*

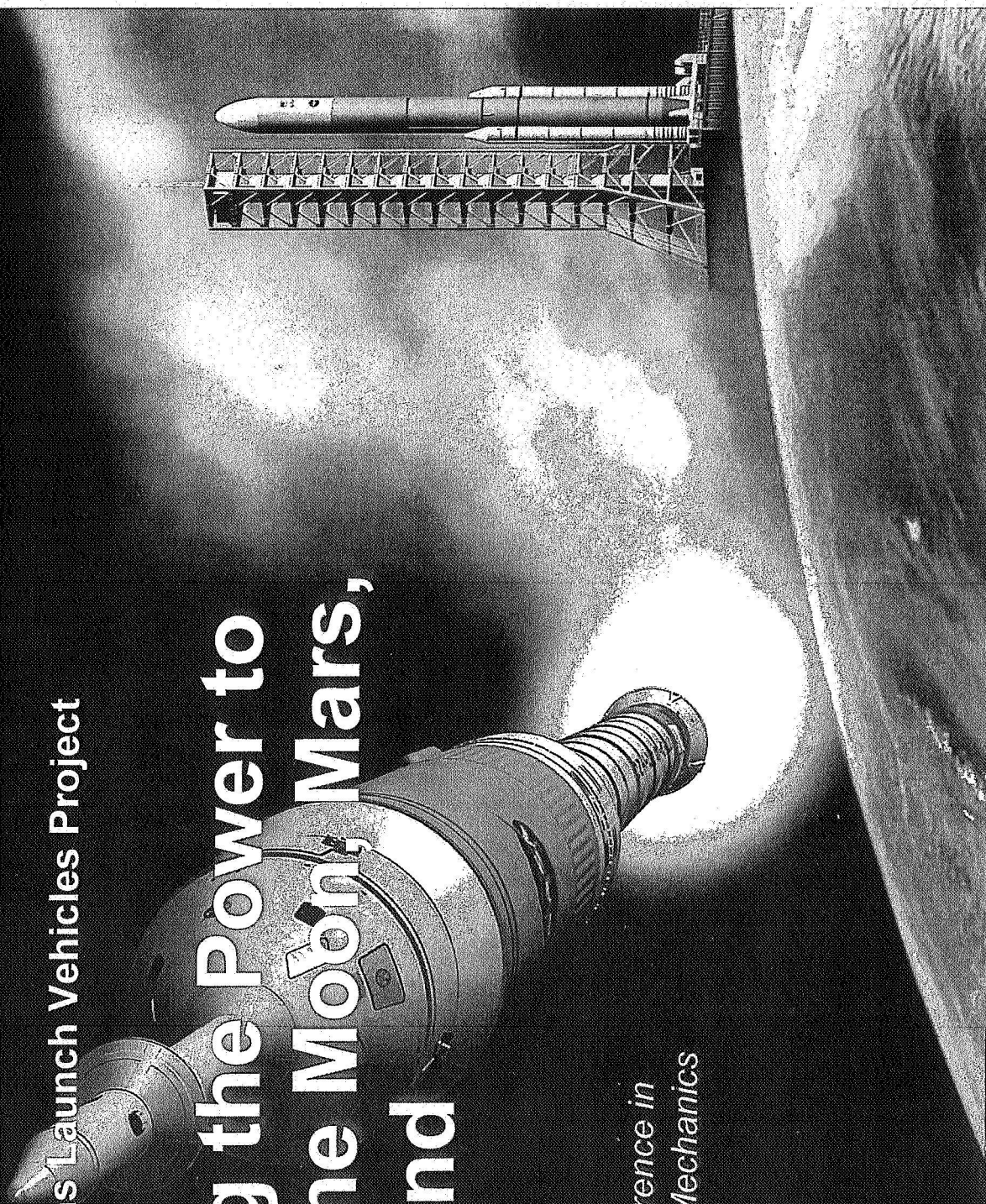
Constellation Systems Launch Vehicles Project

# Delivering the Power to Explore the Moon, Mars, and Beyond

*23rd Southeastern Conference in  
Theoretical and Applied Mechanics*

*Pete Rodriguez, Ph.D.*

*May 21-23, 2006*

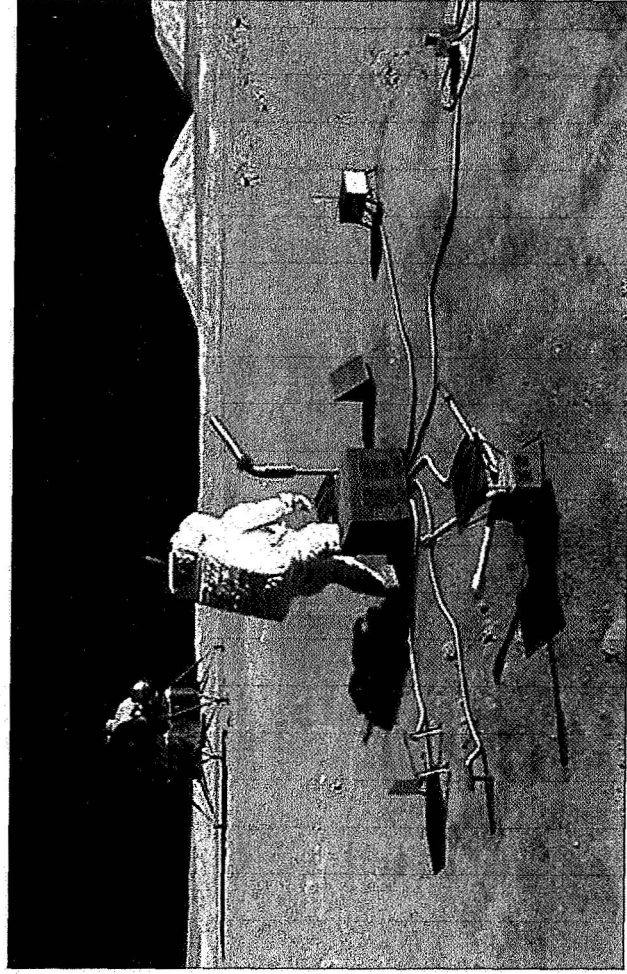


# A Bold Vision for Space Exploration

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- ◆ Complete the International Space Station
- ◆ Safely fly the Space Shuttle until 2010
- ◆ Develop and fly the Crew Exploration Vehicle no later than 2014 (goal of 2012)
- ◆ Return to the Moon no later than 2020
- ◆ Extend human presence across the solar system and beyond
- ◆ Implement a sustained and affordable human and robotic program
- ◆ Develop supporting innovative technologies, knowledge, and infrastructures
- ◆ Promote international and commercial participation in exploration



*"It is time for America to take the next steps."*

*Today I announce a new plan to explore space and extend a human presence across our solar system. We will begin the effort quickly, using existing programs and personnel. We'll make steady progress – one mission, one voyage, one landing at a time"*

*President George W. Bush –  
January 14, 2004*



# The Moon –

## the 1st Step to Mars and Beyond....

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### ◆ Gaining significant experience in operating away from Earth's environment

- Space will no longer be a destination visited briefly and tentatively
- "Living off the land"
- Human support systems



### ◆ Developing technologies needed for opening the space frontier

- Crew and cargo launch vehicles (125 metric ton class)
- Earth ascent/entry system – Crew Exploration Vehicle
- Mars ascent and descent propulsion systems (liquid oxygen / liquid methane)



### ◆ Conduct fundamental science

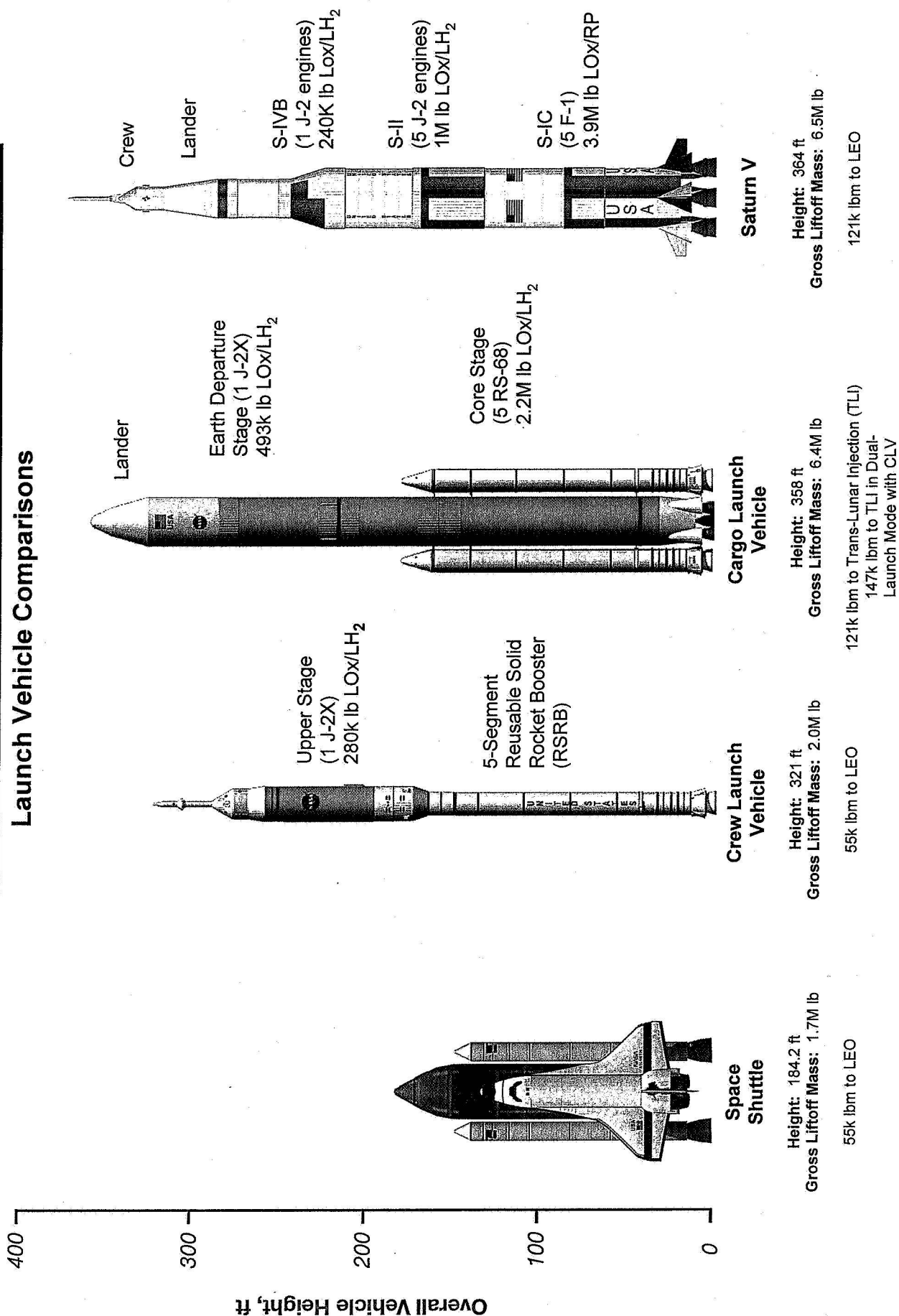
- Astronomy, physics, astrobiology, historical geology, exobiology

## *Next Step in Fulfilling Our Destiny As Explorers*



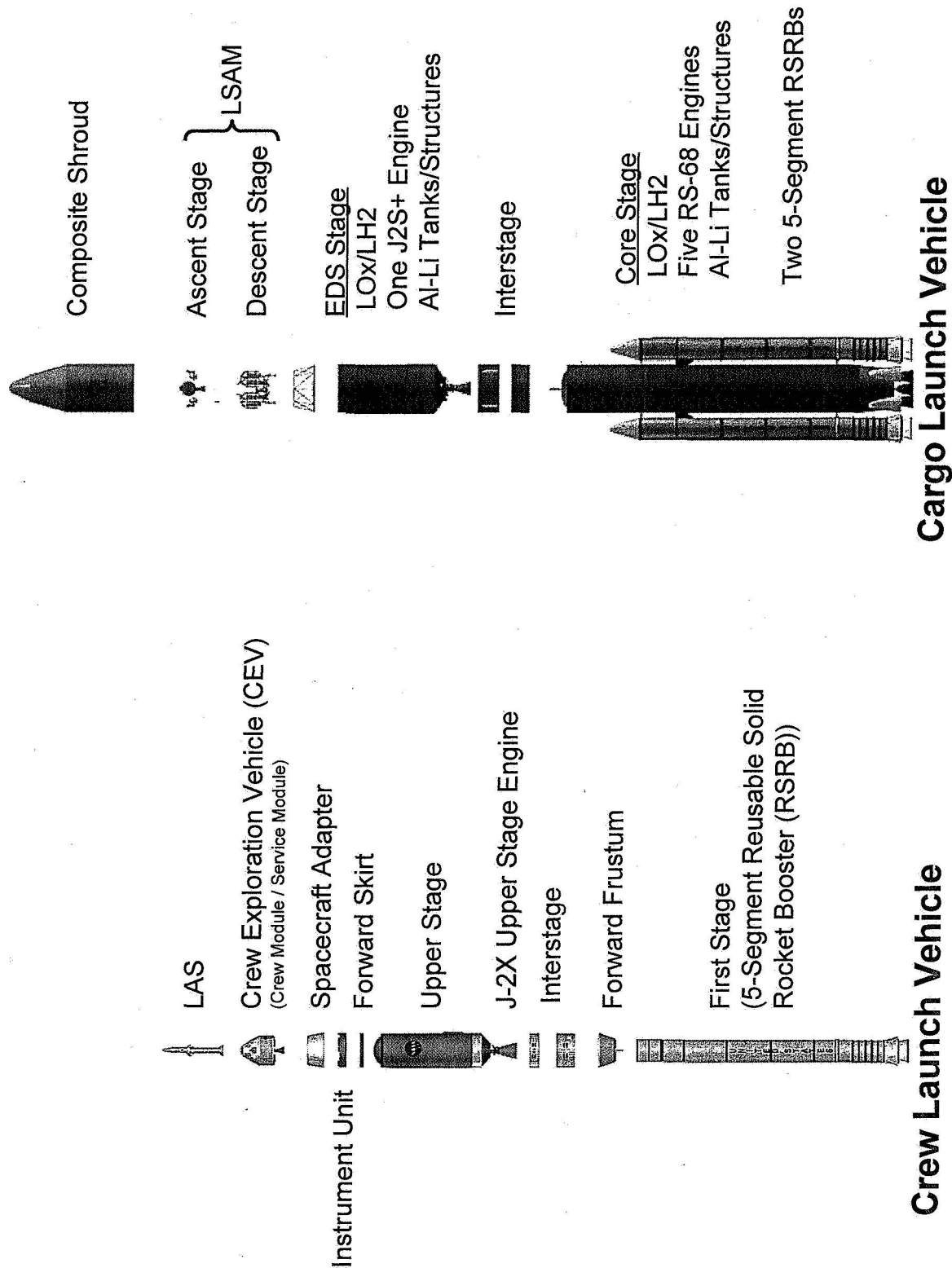
# Building on a

## Foundation of Proven Technologies

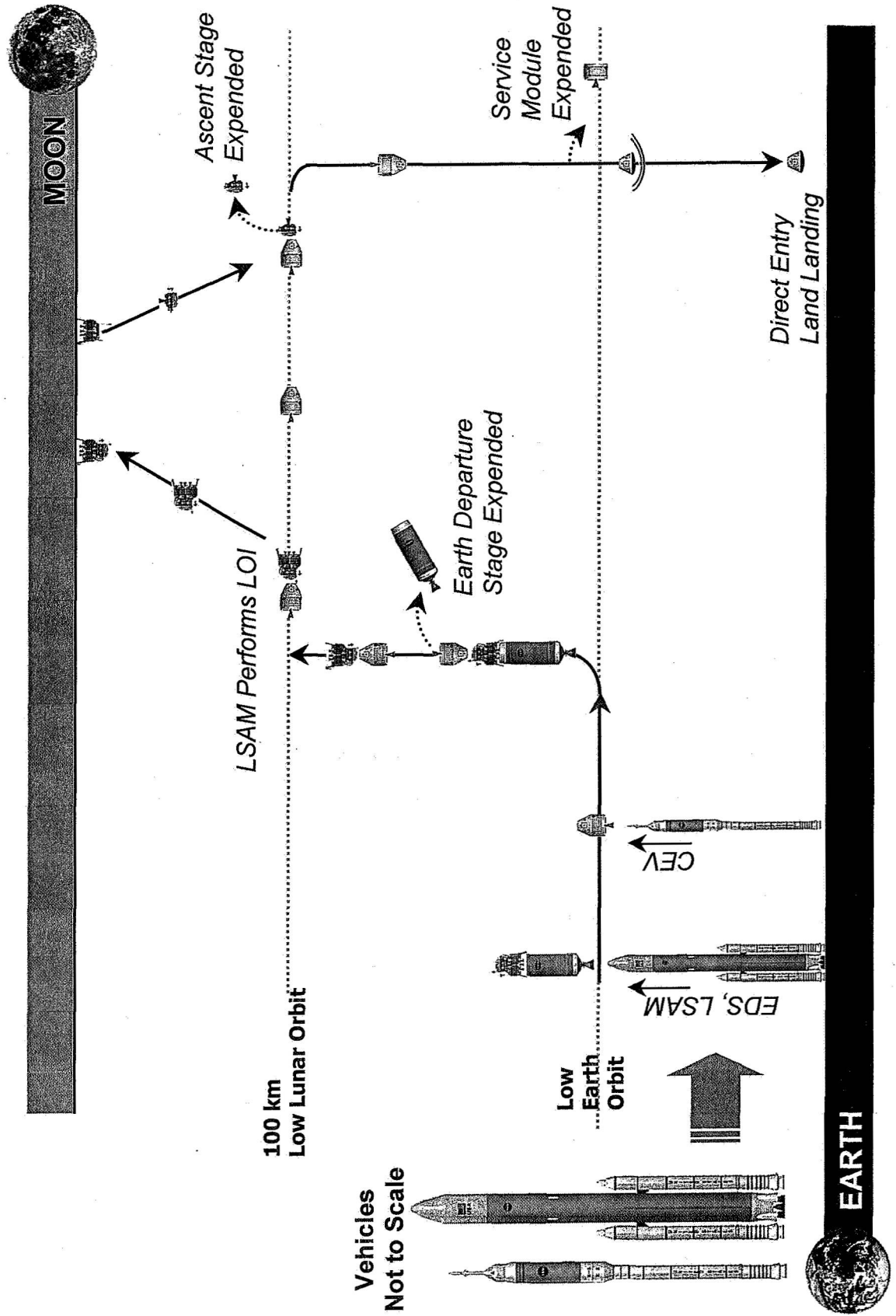




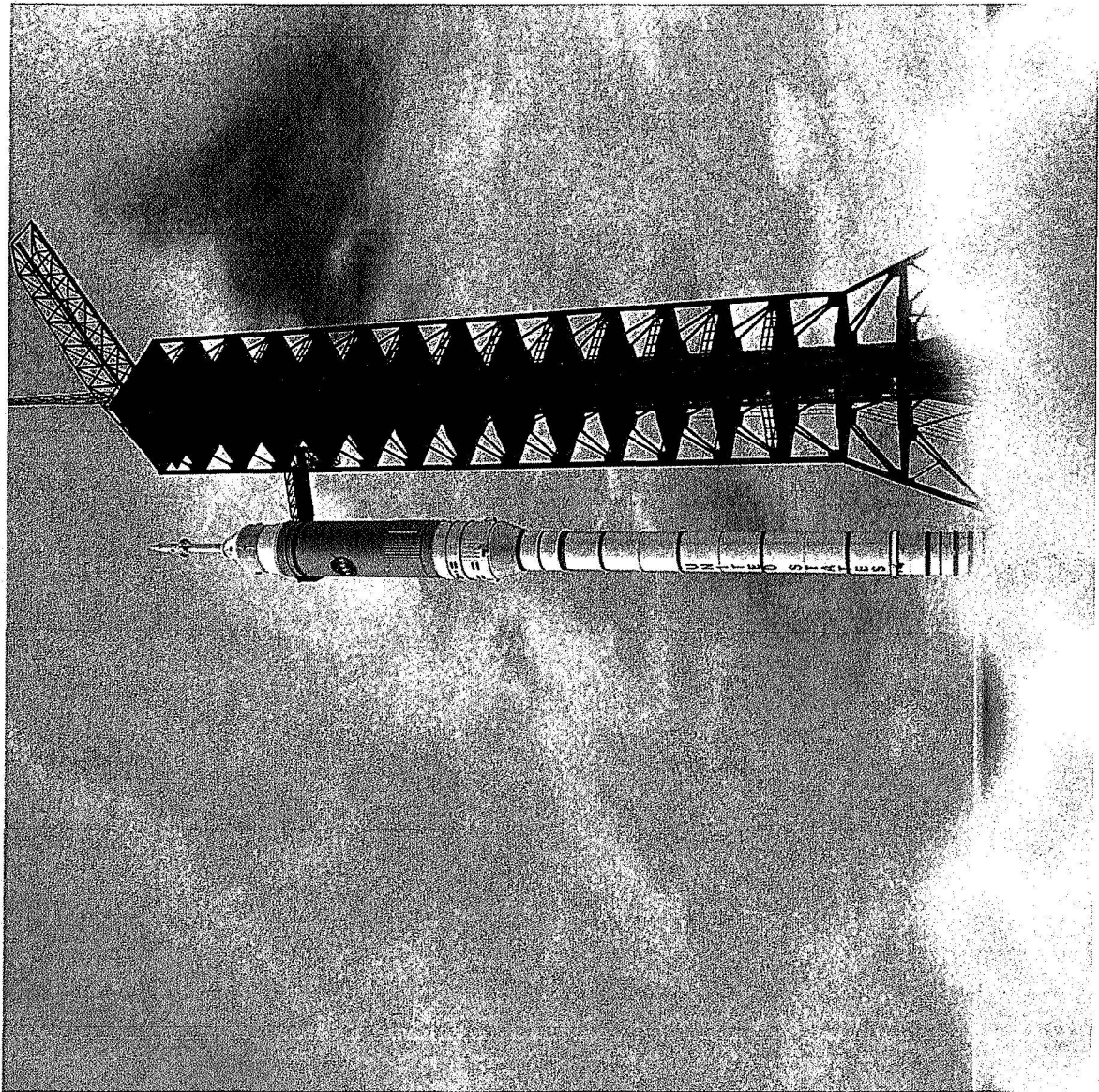
# Constellation Launch Vehicle Elements



# "1.5 Launch" Earth Orbit / Lunar Orbit Rendezvous





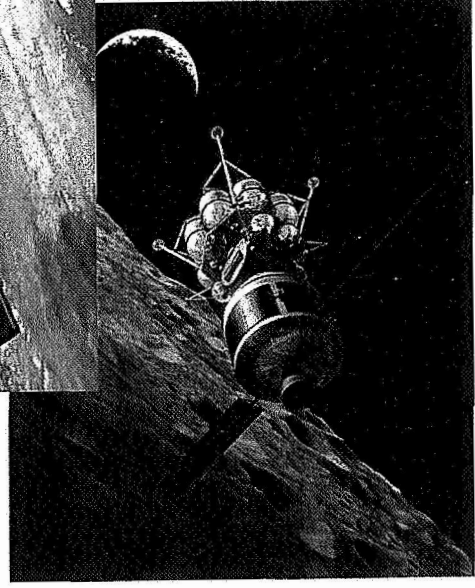
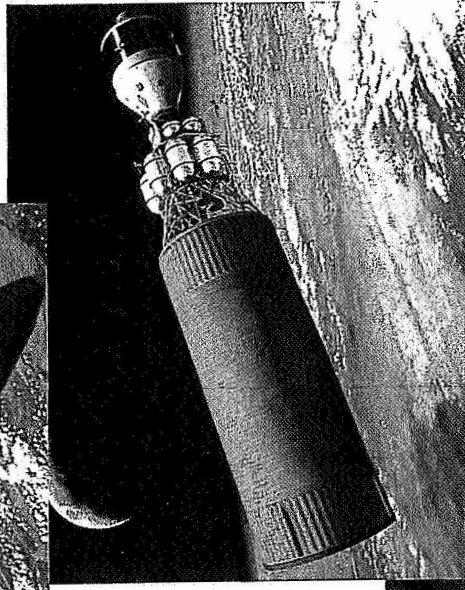


# Design Philosophy for Mission Success

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- ◆ **Keep it simple.**
  - Minimize complexity and interactions.
  - Simplify interfaces.
  - Make it robust.
- ◆ **Focus on reliability, maintainability and supportability early to improve safety and reduce operations costs.**
- ◆ **Apply validated engineering tools, models, and data to new vehicle configurations.**
- ◆ **Apply Lessons Learned**

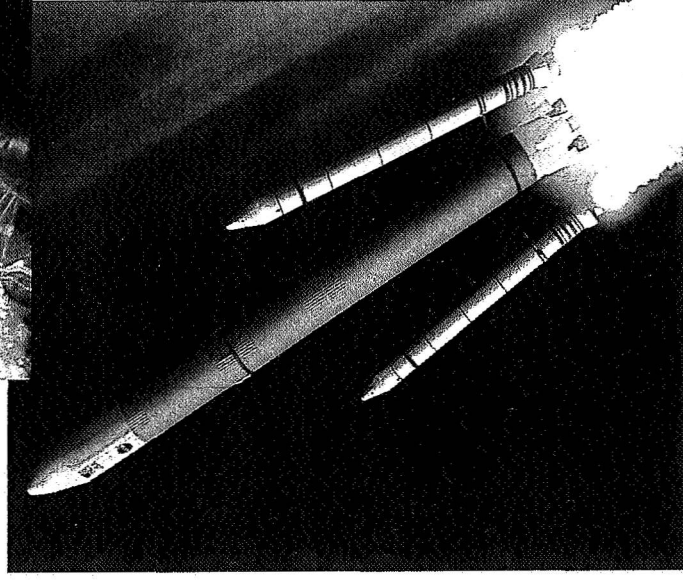
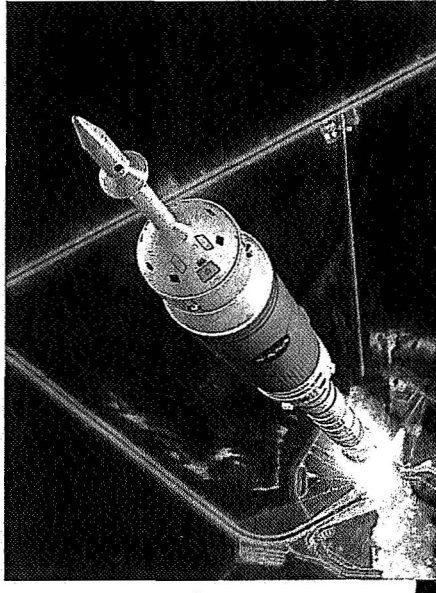


# Summary

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- ◆ Build beyond our current capability to ferry astronauts and cargo to low Earth orbit.
- ◆ Steps will be evolutionary, incremental, and cumulative.
- ◆ To reach for Mars and beyond we must first reach for the Moon.
- ◆ Team is on board and making good progress.
- ◆ Utilizing extensive lessons learned to minimize cost, technical, and schedule risks.







**[www.nasa.gov](http://www.nasa.gov)**

**Subject: FW: abstract**

**Date:** Monday, May 8, 2006 5:54 PM

**From:** Fowler, Betty <Betty.A.Fowler@nasa.gov>

**To:** "Simmons, Alisha" <Alisha.M.Simmons@nasa.gov>

**Cc:** "Narmore, Kim" <Kim.Narmore@nasa.gov>, "Rodriguez, Pete (ED20)" <Pete.I.Rodriguez@nasa.gov>

**Conversation:** abstract

Alisha,

Please use the abstract below to prepare a Word document for Pete's presentation.

Ask me for clarification if needed.

Thanks!

Betty

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**From:** Rodriguez, Pete (ED20)

**Sent:** Monday, May 08, 2006 5:50 PM

**To:** Fowler, Betty

**Cc:** Boaz, Christie; Wilson, Renee

**Subject:** abstract

*The presentation is for a keynote address at the 23rd SECTAM conference in Mayaguez, Puerto Rico.*

*Abstract:*

*As part of the United State's vision for space exploration, NASA is preparing the next Space Launch Vehicles. The presentation will address the overall approach to arriving to and establishing a long-term presence on Mars through experience gained by returning to the moon for an extended period of time, developing technologies needed for opening the space frontier, and conducting fundamental science. The design philosophy for the exploration mission success will be discussed and the importance of learning from lessons of the past will be addressed.*

*I hope this is ok.*

*Thanks, Pete*

*Pete Rodriguez, Ph. D.*

*Manager*

*Test Laboratory*

*Engineering Directorate*

*Marshall Space Flight Center*

*256-544-7006*